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Association Between the Serum Levels of Zinc, Copper and Lipid Profile With Osteoporosis in Iranian Postmenopausal Women

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Background: Trace elements and lipids have an important role in the development of osteoporosis that is a major health problem of postmenopausal women.

Objectives: The purpose of this study was to compare the serum levels of zinc (Zn), copper (Cu) and lipid profile between the postmenopausal women suffering from osteoporosis and the healthy controls. Furthermore, we aimed to determine whether there is an association between the parameters mentioned above and the bone mineral density (BMD).

Patients and Methods: The study was conducted on 116 postmenopausal women; 58 osteoporosis (age 60.6 ± 3.9 years) and 58 control group (age 55.4 ±1.7 years). The serum levels of Zn and Cu were measured by atomic absorption spectrophotometry and BMD was analyzed by DEXA scan.

Results: The serum levels of Zn and Cu were similar in the both groups ($P > 0.05$). Serum levels of low density lipoprotein (LDL) and total cholesterol (TC) in osteoporosis group was statistically significant when compared to the controls ($P < 0.05$). Correlation analysis showed that there was significant association between body mass index (BMI) and BMD values ($P < 0.05$). There was no correlation between serum Zn, Cu levels with lipid profile ($P > 0.05$). However, we found a negative significant correlation between BMD with LDL ($r = -0.31$, $P = 0.001$) and total cholesterol levels ($r = -0.26$, $P = 0.006$).

Conclusions: This study suggested that dyslipidemia might be an independent risk factor of osteoporosis in Iranian postmenopausal women. Moreover, the trace elements did not directly and correlatively influence BMD.

*Keywords:*Osteoporosis; Postmenopause; Bone Density; Lipids; Zinc; Copper

1. Background

Osteoporosis is the most common metabolic bone disease and a major cause that leads to increase fragility of the bone tissue (1, 2). The disease is more common in women than men because they have a smaller bone mass, and during post menopause in women, they produce less sex steroid hormones, which decreases the body's ability to retain calcium in the bones (2). Evidence indicates that osteoporosis affects up to 50 percent of Iranian men and women over 50 years. Osteoporosis is characterized by reduced bone mineral density (BMD) and loss of bone microstructure (3, 4). The best way to measure BMD is using dual energy X-ray absorptiometry (DXA) (4). There are various factors such as: genetic factors, race, age, smoking, alcohol consumption, exercise and nutrition that play roles in the incidence of osteoporosis (5). The risk of nutritional disturbances, particularly trace element deficiency is high during menopause (6). It has been known that Zn and Cu are essential cofactors for enzymes involved in bone metabolism (6, 7). Clinical studies reported that Zn deficiency is associated with retarded growth, alopecia, congenital skeletal disorders and dermal lesions (8-10). Similarly, the evidences from human and animal studies showed that a lock of Cu lead to unsuitable bone formation and bone fracture (11, 12). In the past years, studies have also demonstrated that Zn and Cu deficiency can cause an increase in the risk of bone resorption by inhibiting bone growth and subsequently progression of osteoporosis (7, 13). Some investigators have also shown that atherogenic lipid profile might be associated with osteoporosis in postmenopausal women (14-16). The elderly patients with osteoporosis have a higher risk of cardiovascular disease which is important factor of morbidity and mortality (15, 16). Dyslipidemia in menopause is a known feature in women, leading to significant increase in the development of coronary heart disease (CAD) (17). Griffith et al. found that lipid components are accumulate on bones or vessels around bone and promote reduced BMD in rats (18). Several studies

Implication for health policy/practice/research/medical education:
Effects of trace elements and lipid profile on osteoporosis postmenopausal women are the implication of our study.